REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Claim 1 has been amended to recite a convex portion extending toward the die at a top part area of the punch corresponding to a site to be formed at the initial stage of forming, e.g., the convex portions 1a-1d. Allowable Claim 3 has been rewritten in independent form. Method Claim 4 has been rewritten in independent form and amended for clarity. Claim 5 has been amended to delete the "inclined vertical wall portion" limitation, which has been incorporated into new Claim 8. Allowable Claim 6 has been rewritten in independent form.

Claim 1 was rejected under 35 U.S.C. § 102 as being anticipated by U.S. patent 5,544,517 (Shimizu). Claim 1 has now been amended to recite a further structural distinction over the prior art, i.e., the convex portion extending toward the die and formed at a top part area of the punch corresponding to a site to be formed at the initial stage of forming. Such a convex portion, such as 1a, induces an "overrun" in which the material is wound over the shoulder of the convexity. Spring-back from the overrun after the release of the metal sheet causes the bending angle to approach and ideal value (Fig. 8; page 19, lines 2-16).

The presently claimed convex portion extending toward the die and formed at a top part area of the punch corresponding to a site to be formed at the initial stage of forming is not taught or suggested by Shimizu. The punch 5 of Shimizu is flat and lacks the claimed convex portion, and so amended Claim 1 is not anticipated by Shimizu.

Applicants recognize that the ironing die portion 4 in Shimizu has a convexity 12. However this would not have rendered the claimed convex die portion obvious, for a number of reasons:

1. Shimizu is directed to a punch and die used for redrawing a can, including an ironing die, wherein the convexity 12 is used to reduce the thickness of the can. This would

not have motivated one skilled in the art to provide a convexity in the absence of an ironing operation.

2. The convexity 12 is on the die and not the punch. Therefore, if used in a process which permits "overrun" and "spring-back," the "overrun" and "spring-back" would have an opposite sense to that induced where the convexity is provided on the punch, causing the spring-back angle to increase rather than approach zero. In view of this differing result, the absence of the convexity on the punch cannot simply be dismissed as a reversal of parts.

3. The convexity 12 is not located at a part corresponding to a site to be formed at an initial stage of forming, but at the *final* region of interaction between the punch and die.

In view of the unobvious nature of these distinctions, Claim 1 thus clearly defines over Shimizu.

Claim 4 was also rejected under 35 U.S.C. § 102 as being anticipated by Shimizu. Claim 4 is directed to a press forming method for a metal sheet. Press formed metal sheets have conventionally suffered from the problem of wall warp to produce an undesirable flange spring angle, as illustrated in Figure 3B. Applicants have discovered that the flange spring angle can be minimized if the clearance between the punch and die used in the press forming is arranged such that the clearance CL2 between the die and a portion of the punch which enters the die immediately after the initial stage of press forming is greater than the clearance CL1 between the die and the portion of the punch which enters the die in the initial stage of press forming, by an amount at least equal to the thickness of the metal sheet to be formed by the press forming method (i.e., $CL2 \geq CL1+t$), where CL1 is approximately equal to t (i.e., $0.8 \times t \leq CL1 \leq 1.2 \times t$).

For example, referring to the non-limiting embodiments of Figures 4-14, a punch 1 having a convex end portion 1a moves to enter the die 2, as a result of which the convex end portion 1a enters the die in the initial stage of press forming (Figure 9B). Subsequently, a

portion of the die other than the convex end portion 1a also enters the die. In accordance with the invention recited in Claim 4, the clearance CL1 between the die 2 and the convex end portion 1a of the punch 1 in this embodiment is within the range 0.8t and 1.2t. Additionally, in accordance with this embodiment the clearance CL2 between the die and the portion of the punch other than the convex end portion 1a is equal to or greater than CL1+t. As a result, the flange spring angle approaches 0°.

For example, referring to Example 1 and Figure 19 in the specification, wherein t = 1.2 mm, the clearance CL2 was changed while the clearance CL1 was maintained at t, and the flange spring angle was measured. As is evident from Figure 19, the flange spring angle approached 0° for values of CL1 exceeding CL2+t. On the other hand, in the comparative cases wherein CL2 = CL1 or CL2 = CL1+0.5 mm, the flange spring angle was 48° and 26.9°, respectively. It is thus evident that the value of CL2 ≥ CL1+t when CL1 is approximately equal to t is critical for minimizing the flange spring angle.

According to the outstanding rejection, Shimizu discloses a method of forming a metal sheet having a punch 5 and a die 3-4, wherein the clearance C1 corresponds to CL2 and the clearance C2 corresponds to CL1, and the values of the clearances C1 and C2 satisfy the expressions of Claim 4. However, this is respectfully traversed.

Initially, the Examiner's attention is respectfully directed to the fact that the process to be carried out must be considered in a method claim. Claim 4 recites a press forming method. On the other hand, Shimizu discloses a reforming method in which a predrawn can is thinned and ironed. It thus has no relation to the method of Claim 4.

Shimizu is directed to a method of redrawing a predrawn coated metal can. According to Shimizu, a blank having a thickness T_0 is predrawn to a thickness of T_1. The predrawn can having a thickness of T_2 is then introduced into the disclosed tool having a redrawing die 3, an ironing die 4, a punch 5 and a blank holder 1. The predrawn can is then

redrawn from the predrawn thickness T_2 to a redrawn thickness T_3. In doing so, a gross reduction ratio of $(T_0-T_3)/T_0$ is preferably in the range of 20-60% (column 2, lines 60-65). Additionally, the clearance C2 is preferably between 0.8 T_0 and 0.3 T_0, and the clearance C1 is preferably between 0.8 T_0 and 1.4 T_0.

A calculation of the relationships of C1, C2 and T_3 (the thickness of the metal sheet after the redrawing operation) according to the gross reduction ratio disclosed in Shimizu reveals that C1 can range from equal to C2 (where $C2 = C1 = 0.8T_0$) to $C2 + 11T_3$. Therefore the expressions 1 and 2 in Claim 4 will result in values of CL1 and CL2 which fall within the broad ranges that can be calculated from the dimensions and ratios disclosed in Shimizu.

However, in such a case where the prior art discloses a broad range within which the claimed range lies, but does not disclose specific examples corresponding to the claimed range, the claims *are not anticipated* unless the claimed subject matter is disclosed in the reference with "sufficient specificity to constitute an anticipation under the statute. ... If the claims are directed to a narrow range, the reference teaches a broad range, and there is evidence of unexpected results within the claimed narrow range, depending upon the other facts of the case, it may be reasonable to conclude that the narrow range is not disclosed with 'sufficient specificity' to constitute an anticipation of the claims. The unexpected results may also render the claims unobvious." M.P.E.P. § 2131.03(II).

In fact, the present specification provides evidence of unexpected results within the claimed narrow range sufficient to conclude that the specific claimed range is not taught by Shimizu. Shimizu discloses a broad range of punch and die dimensions where CL2 (C1) is equal to CL1 (C2), i.e., C1 = C2. There is no suggestion of criticality for CL2 to be greater than CL1 by at least the thickness of the metal sheet to be formed. It is only the present specification which provides evidence that CL2 must be greater than CL1 by at least the thickness of the metal sheet to be formed, for the flange spring angle to approach 0°. Indeed,

the range of Shimizu specifically teaches the *comparative* example (CL1 = CL2) for the evidence of criticality in the present specification. In view of this evidence of criticality in the specification, and the fact that Shimizu specifically teaches a value C1 = C2 producing a flange spring angle approaches 48°, Applicants respectfully submit that the broad range which can be calculated from Shimizu does not anticipate or render obvious the specific range recited in the claims with "sufficient specificity" under 35 U.S.C. § 102 or 35 U.S.C. § 103. Claim 4 is therefore neither anticipated nor rendered obvious by Shimizu.

Claim 5 was rejected under 35 U.S.C. § 102 as being anticipated by U.S. patent publication 2002/0083754 (Miyauchi et al), particularly at Figure 3 thereof. Claim 5 is directed to a feature of the invention whereby a forming jig is mounted to move in synchronism with the die while keeping a relative position to the die during forming. For example, the jig 3 of the embodiment of Figures 15-18 moves in synchronism with the die 2 while keeping a relative position to the die during forming. According to Claim 5, a clearance CL4 between the forming jig and the die in the vicinity of a die shoulder of the die is set to be wider than a clearance CL3 between the forming jig and a die in a forming area other than the vicinity of the die shoulder.

According to the Office Action, this clearance is taught by a measurement of the dimensions in Figure 3 of Miyauchi et al. However, this rejection is respectfully traversed for a number of reasons.

First, Applicants note that there is no description in Miyauchi et al of the dimensions of the clearances corresponding to CL3 and CL4. Instead, the Examiner has relied entirely on a measurement of the dimensions in Figure 3. It is respectfully submitted that reliance upon dimensions in prior art figures without supporting description in the specification is insufficient evidence to support a rejection under 35 U.S.C. § 102. *In re Wright*, 193 USPQ

332 (CCPA 1977); M.P.E.P. § 2125. For this reason alone, the rejection under 35 U.S.C. § 102 is legally insufficient.

Additionally, there is no evidence that the inner die 26 of Miyauchi et al, which the Examiner considers to be the "forming jig," moves or is mounted to move in synchronism with the outer die 24 while keeping a relative position to the outer die 26 during forming. Instead, the *explicit* description in Miyauchi et al is that the inner die 26 does *not* keep a relative position to the outer die 24 during forming. Figure 3 illustrates an apparatus for continuously forming ring grooves in a cup wall "by changing the relative position between the inner die 26 and the outer die 24 and controlling the vibrating speed and the ironing speed during ironing" (paragraph [0037]). That is, the inner die 26 is vibrated or reciprocated relative to the outer die 24 during forming and does not "keep a relative position to the die during forming." For this reason as well, Claim 5 clearly defines over Miyauchi et al.

New Claim 8 recites that the die has an inclined vertical wall to form an inclined vertical wall portion of the metal sheet. This is not taught in Miyauchi et al.

Applicants therefore believe that the present application is in a condition for allowance and respectfully solicit an early Notice of Allowability.

Respectfully submitted,

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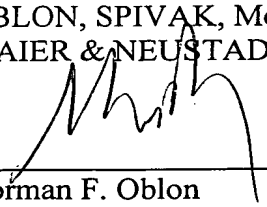

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